

**Amendments to the Specification**

Please revise the paragraph beginning at page 6, line 35 as follows:

--In the present context the term 'a geodetic curve' is taken to mean a curve on a surface for which the curve has a primary normal vector which in all points is identical to the normal vector of the surface. A geodetic curve on a surface represents the shortest distance along the surface between two points on the surface. A geodetic curve on a surface has a geodetic curvature  $\rho_g = 0$ , the geodetic curvature of a curve at a point P on a surface being defined as the length of the projection (calculated with ~~sign~~ sine) of the vector of curvature on the tangent plane of the surface at the point P. The vector of curvature  $\rho \mathbf{n}$  of curve  $\mathbf{r}(s)$  at a point P (given as  $\mathbf{r}_1(s)$ ) is defined as  $d^2\mathbf{r}_1/ds^2 = \rho \mathbf{n}$ ,  $\rho$  being the curvature of the curve at the point P and  $\mathbf{n}$  a unit vector.--

Please revise the paragraph beginning at page 7, line 20 as follows:

-- A geodetic curve between two points on a surface may in practice be found by means of a string with no bending resistance, which under tension will find the shortest path between ~~[[to]]~~ two points.--

Please revise the paragraph beginning at page 7, line 24 as follows:

--In an embodiment of the invention, said support unit has an outer surface that describes a surface of revolution with an axis of revolution that coincides with the longitudinal axis of the flexible pipe. This has the advantage of providing a symmetric element which is relatively easily manufactured. Alternatively, the support unit may take many other forms, e.g. more complex forms where elements are arranged to receive individual armouring wires. In an embodiment of the invention, the supporting surface of

the support unit in the area where the straight-line-end-point is located is individually formed for different wires having their straight-line-end-point located on the support unit. An advantage ~~of hereof~~ thereof is that assembly of the wires to the end fitting is eased and reliability improved. In an embodiment of the invention, the supporting surface of a wire is a single curved surface oriented such that ~~every normal to this~~ any normal to the single surface lies in a plane that is parallel to any plane containing the longitudinal axis of the pipe. In the present context, “a single curved surface” is taken to mean a surface that curves in only one dimension (a simple example is a cylinder generated by a circle, but any other curve may be used). The use of a single curved surface in the present construction has the advantage that the construction of the individual surface parts are well-suited for implementation with standard manufacturing tools (e.g. numerically controlled tools).--

Please revise the paragraph beginning at page 10, line 11 as follows:

--In a preferred embodiment, said second body is a cylinder. Alternatively the second body may include a ~~conoidous~~ conoid part, whose surface extends away from or ~~verge~~ verges on its axis of revolution when viewed from the torus formed part of the support unit in the direction of the end fitting. In another preferred embodiment, the support unit comprises a concave part extending from the convex part of the support unit hosting the straight-line-end-point in a direction towards the wire-pipe-exit-point, the concave part having an outer surface with an inward curvature (or a linear surface, when viewed in a cross section including the longitudinal axis of the flexible pipe).--

Please revise the paragraph beginning at page 11, line 29 as follows:

--To avoid the intrusion of impurities, it may be advantageous to fill the space around the free path part (or straight-line-section) of the armouring wire path with a filler that does not substantially ~~effect~~ affect the free movement of the armouring wire. Such material could e.g. be a suspension or emulsion of a polymer, e.g. polyethylene or polyurethane. A further advantage hereof is that such a material may be used for cooling or flushing purposes, if the end fitting is cooled with a coolant, e.g. water to remove heat from the transported fluid of the flexible pipe, e.g. an oil of an elevated temperature compared to room temperature.--

Please revise the paragraph beginning at page 13, line 18 as follows:

--In an embodiment of the invention, said armouring wire or wires are made of a composite material, said composite material preferably comprise one or more polymers, such as epoxy, thermoplastic and polyurethane, optionally comprising reinforcing fillers such as fibres and/or whiskers. An advantage thereof is that the pipe is stronger (tensile strength) and lighter (which is a special advantage during layout and use in deep ~~see~~ sea environments), and more corrosion resistant in certain media than a corresponding pipe comprising metallic armouring wires.--

Please revise the paragraph beginning at page 14, line 10 as follows:

--In an embodiment of the invention, said armouring wire or wires is/are in the form of a layered wire comprising 2 or more layers of materials which layers ~~being~~ are held together by a wrapping material and/or by adhesive forces. An advantage of using a wrapping material is that it may save the use of adhesives. An advantage of using an

adhesive is that it maintains positions of the layers and the assembly structure in production and provides means/possibility to splice.--

Please revise the paragraph beginning at page 15, line 13 as follows:

--In an embodiment of the invention, the armouring wire or wires ~~being~~ are anchored by use of a spreader element driven into the wire or wires in said locking cavity or cavities.--

Please revise the paragraph beginning at page 16, line 5 as follows:

--In an embodiment of the invention, the flexible pipe comprises two armour layers and the end fitting ~~comprise~~ comprises two annular support units, the wire or wires of a first armour layer being supported by a first annular support unit, and the wire or wires of a second armour layer being supported by a second annular support unit.--

Please revise the paragraph beginning at page 16, line 10 as follows:

--In an embodiment of the invention, the pipe structure comprises a reinforcement sleeve layer placed below the one or more armouring layer or layers, said reinforcement sleeve layer ~~extend~~ extending along the pipe structure in a length which ~~include~~ includes the section of the pipe structure between the wire-pipe-exit-point and the straight-line-end-point, said reinforcement sleeve preferably ~~extend~~ extending along the pipe structure in a length which includes the anchoring point or points on the end-fitting.--

Please revise the paragraph beginning at page 17, line 27 as follows:

-- The pipe structure 10 (comprising a flexible pipe and an end fitting) comprises two armouring layers, a lower armouring layer 11 and an upper armouring layer 19, each comprising a helically wound armouring wire (111 and 191, respectively). For clarity, only one armouring wire of each layer is shown in the drawing. It should be noted that the armouring wires 111 and 191 may represent examples of a multitude of armouring wires constituting the lower and upper armouring layer, respectively. It should further be noted that the parts 193, 113 (see later) of the armouring wires of the upper and lower armouring layer, respectively, may not originate from (be part of) the *same* physical wire as is indicated by the reference numerals 191, 111, respectively. The armouring wires of the two armouring layers are wound with opposite winding angles (as seen relatively to the longitudinal direction 121 of the flexible pipe). The winding angles  $\alpha_{\text{upper}}$ ,  $\alpha_{\text{lower}}$  of the upper and lower armouring ~~layer~~ layers, respectively, are preferably in the range between 50 and 60°, e.g.  $\alpha_{\text{upper}} = -\alpha_{\text{lower}} = 55^\circ$ .--

Please revise the paragraph beginning at page 20, line 1 as follows:

-- Guiding channels 153 are arranged on or in connection with the transition part 154 of the support unit that supports the armouring wire between the landing part 152 and the terminating part 14 which hosts the anchoring elements 141. The anchoring of the wire may alternatively be located on the transition part 154. The transition part of the support unit has a conical outer surface that ~~verge~~ verges on the longitudinal axis 121 of the flexible pipe when viewed in a direction of the terminating flange 181. This yields a preferred, relatively compact solution. It may alternatively extend outwards, and possibly

have an outward curvature. It is preferred that the wire end fitting section 193 of the path of the armouring wire is adapted to be free from 'points of discontinuity', i.e. that the outer surface transitions between the various parts of the support unit 15 are 'smooth'.--

Please revise the paragraph beginning at page 20, line 22 as follows:

--In fig. 2, the path of an armouring wire at the transition between the flexible pipe and the end fitting is shown. In a preferred embodiment as illustrated in fig. 1, each armouring layer has its own support unit (15 and 17 in fig. 1). Fig. 2 and the following description may apply to the lower armouring layer 11 as well as to the upper armouring layer 19 of fig. 1. The armouring wire 211 - preferably of a composite nature - initially conforming to the underlying surface 22 at a prescribed helical angle with the longitudinal axis 221 of the flexible pipe, is formed away from the underlying pipe surface 22, in such a way that the tangent direction at the point of separation 215 from the underlying surface is followed by the wire until this direction becomes tangent with the outer surface of a torus 252 at a straight-line-end-point 216, this torus being a part of the support unit ~~[[25]]~~ 251. In a preferred embodiment, the wire 211 then follows a geodetic curve from the point of tangency 216 on the torus, until another surface 254 supports the wire. The geodetic curve is found by winding under tension. On this second surface the wire again follows a geodetic curve and may be securely and completely anchored by various means in an anchoring element (not shown, but corresponding to 141 in fig. 1). Between the pipe tangent point 215 (the wire-pipe-exit-point) and the torus tangent point 216 (the straight-line-end-point), the wire follows a straight line path 214. The wire, having a rectangular cross section, is twisted to conform to both surfaces at the tangent

points. In a preferred embodiment of the invention, the wire is surrounded by a soft filler material (e.g. an emulsion of a polymer) at least over the free path, unsupported section between the tangent points. The soft material is chosen to have a negligible effect on the deformation behaviour of the pipe and composite wire. This soft material may provide cooling or flushing of the environment surrounding the composite wire. The filler may be introduced in the volume of the end fitting limited by the support unit and the underlying pipe layer (e.g. the reinforcement section) and an outer layer surrounding the armouring layers or by the casing 18 of the end fitting (cf. fig. 1) extended in the opposite direction of the end fitting.--

Please revise the paragraph beginning at page 22, line 33 as follows:

--Fig. 4.b shows a cross sectional view of the armouring wire 41 in the locking cavity 45 in the cross section indicated by 421 in fig. 4.a whereas fig. 4.c shows a cross sectional view of the armouring wire 41 in the locking cavity 45 in the cross section indicated by 422 in fig. 4.a. In fig. 4.b the cross sectional area  $A_1$  comprises the wedge 44 and the two separated parts 411, 412 of the wire embedded in an adhesive 431 fully ~~[[of]]~~ or partially filling the empty volume between the wire and the surrounding solid material of the anchoring element 42. In fig. 4.c the cross sectional area  $A_2$  comprises essentially only the wire 41 surrounded by the solid material of the anchoring element 42.--

Please revise the paragraph beginning at page 23, line 13 as follows:

--Fig. 5.a shows an anchoring element 52 for locking an armouring wire 51 to an end fitting by means of a wedge formed spreader element 54 having a narrow end 541 and a

broad end 542, the locking cavity 55 for holding the wire end and the spreader element having a continuously changing cross sectional area (at least over a part of its length along the wire), so that a first cross sectional area  $A_1$  is larger than a second cross sectional area  $A_2$ , both taken perpendicular to the longitudinal direction of the wire in the locking cavity, the first cross section 521 (corresponding to  $A_1$ ) being taken closer to the broad end 542 of the spreader element 54 than the second cross section 522 (corresponding to  $A_2$ ) when the spreader element 54 is placed in the locking cavity 55. The anchoring element 52 for fixing an armouring wire 51 to an end fitting comprises a locking cavity 55 formed in a solid material (which may be part of a terminating element hosting a number of anchoring elements, cf. 14 or 16 in fig. 1) and a wedge-formed element 54 adapted to be driven into the end of an armouring wire 51 thereby separating the wire in two parts 511, 512 over a certain length (when viewed in a cross section including a longitudinal axis of the wire) and fixing the wire to the solid material. A moulding 53 may preferably be introduced between the wire 51 and the walls of the locking cavity 55.--

Please revise the paragraph beginning at page 24, line 29 as follows:

--The turns thus form a compressive reinforcement 4 which prevents the inner liner 3 from bursting because of a high pressure on the inner side of the pipeline, or from collapsing because of a high pressure on the outer side of the pipeline.--



Please revise the paragraph beginning at page 26, line 29 as follows:

-- The armouring wire 71 of the armour layer 7 has a conforming-wire-pipe-section 711 which conforms to the underlying pipe layer that includes the armouring reinforcement section 74 until a wire-pipe-exit-point 712 where the armouring wire tangentially extends away from the underlying pipe layer and thereby the armouring reinforcement section 74. The wire extends over a straight-line-section 713 to the tangential point of contact 714 (the straight-line-end-point), where a curved surface 731 of the individual-wire-support-slot 73 provides a smooth and controlled transition to the wire anchoring. The straight wire section 715 of the transition to the ~~anchoring-section~~ locking cavities 735 ensures that the anchoring is loaded only by a pure unidirectional tension, which maximise the effectiveness of the anchoring principle. The wire is lead into the locking cavity 735 by the straight-slot-section 732, wherein the wire is anchored. The anchoring is provided by driving a wedge formed spreader element 718 into the end of the wire 71, and ~~secure~~ securing the split armour wire parts 716 and 717 to the spreader element by gluing. Furthermore, anchoring is provided by the principle described in fig. 5, since the angled surfaces 733 and the locking-cavity-side 734 provides an expanding cross sectional area of the locking cavity 735, and the wedged end 719 of the wire 71 also provides an increasing cross section, both in the direction towards the broad end of the wedged wire. An angled surface 733 and its adjacent straight-slot section surface 732 may preferably form an angle between 25° and 50°. A locking-cavity-side surface 734 and its adjacent straight-slot section surface 732 may preferably form an angle between 0° and 30°. The offset of the wedged wire end 719 relative to the locking cavity 735, in the direction of

S/N 10/536,942

and away from the straight-slot-section 732, creates room for a moulding material, as described with respect to fig. 5.--